

Remote, Redesigned Air Bag Special Study

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Dynamic Science, Inc., Case Number (1998-081-803F)

1998 Ford Taurus 4-door sedan

Washington

November/1998

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16. Abstract <p>This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Taurus 4-door sedan. This minor injury crash occurred in November, 1998 in the evening. The weather was clear and the bituminous roadways were dry. The crash occurred in a four leg intersection. The northbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two northbound lanes, one northbound left-turn lane, and two southbound lanes. The speed limit for this road is 72 kmph (45 mph). It is controlled by overhead traffic signals. There is a >2% northbound downhill grade at the area of impact. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; two westbound lanes and two eastbound lanes. The speed limit and grade are not known for this road. It is controlled by overhead traffic signals. Vehicle 1, a 1998 Ford Taurus 4-door sedan (case vehicle) driven by a 24 year old male (165 cm/65 in, 68 kg/150 lbs), was traveling north in the northbound left-turn lane approaching the intersection at a driver estimated speed of 24 kmph (15 mph) preparing to make a left turn at the intersection. The traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 25 year old male (165 cm/65 in, 73 kg/160 lbs) who was restrained by the available manual lap/shoulder restraint. Vehicle 2, a 1994 Isuzu Rodeo compact sport utility vehicle driven by a 43 year old female, was traveling south in the right southbound thru lane at an unknown speed preparing to travel straight through the intersection. The traffic signal was in the green phase at this time. It is unknown if the driver was restrained. There were no other occupants in the vehicle. The driver of Vehicle 1 failed to yield to opposing traffic and initiated the left turn in the path of Vehicle 2. The front plane of Vehicle 2 (unknown CDC) struck the right plane of Vehicle 1 (01RZEW3) in the intersection. Vehicle 1 rotated clockwise after impact and came to rest on the north side of the intersection facing north. Vehicle 2 rotated clockwise after impact and came to rest in the original travel lane facing southwest. A Delta V was calculated for Vehicle 1, using the Missing Vehicle Algorithm of WinSMASH, as 17 kmph (11 mph). As a result of the impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed. The driver of Vehicle 1 sustained non-incapacitating injuries in the crash and was transported by land to a hospital where he was treated and released. The passenger of Vehicle 1 was not injured and did not receive medical attention. The driver of Vehicle 2 was not reported as injured. Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.</p>					
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Ford Taurus 4-door sedan. This minor injury crash occurred in November, 1998 in the evening. The weather was clear and the bituminous roadways were dry. The crash occurred in a four legged intersection. The northbound leg of the intersection is a two-way undivided roadway and is comprised of five travel lanes; two northbound lanes, one northbound left-turn lane, and two southbound lanes. The speed limit for this road is 72 kmph (45 mph). It is controlled by overhead traffic signals. There is a >2% northbound downhill grade at the area of impact. The eastbound leg of the intersection is a two-way undivided roadway and is comprised of four travel lanes; two westbound lanes and two eastbound lanes. The speed limit and grade are not known for this road. It is controlled by overhead traffic signals.

Vehicle 1, a 1998 Ford Taurus 4-door sedan (case vehicle) driven by a 24 year old male (165 cm/65 in, 68 kg/150 lbs), was traveling north in the northbound left-turn lane approaching the intersection at a driver estimated speed of 24 kmph (15 mph) preparing to make a left turn at the intersection. The traffic signal was in the green phase at this time. The driver was restrained by the available manual lap/shoulder restraint. The front right seat was occupied by a 25 year old male (165 cm/65 in, 73 kg/160 lbs) who was restrained by the available manual lap/shoulder restraint.



Figure 1. Exterior, Vehicle 1 (Ford Taurus)



Figure 2. Exterior, Vehicle 2 (Isuzu Rodeo)

Vehicle 2, a 1994 Isuzu Rodeo compact sport utility vehicle driven by a 43 year old female, was traveling south in the right southbound thru lane at an unknown speed preparing to travel straight through the intersection. The traffic signal was in the green phase at this time. It is unknown if the driver was restrained. There were no other occupants in the vehicle.

Crash Events

The driver of Vehicle 1 failed to yield to opposing traffic and initiated the left turn in the path of Vehicle 2. The front plane of Vehicle 2 (unknown CDC) struck the right plane of Vehicle 1 (01RZEW3) in the intersection. Vehicle 1 rotated clockwise after impact and came to rest on the north side of the intersection facing north. Vehicle 2 rotated clockwise after impact and came to rest in the original travel lane facing southwest.



Figure 3. Crash scene. Vehicle 1 approach to impact.

A Delta V was calculated for Vehicle 1, using the Missing Vehicle Algorithm of WinSMASH, as 17 kmph (11 mph). As a result of the impact, the supplemental restraint system (driver’s and passenger’s frontal redesigned air bags) of the case vehicle deployed.

The driver of Vehicle 1 sustained non-incapacitating injuries in the crash and was transported by land to a hospital where he was treated and released. The passenger of Vehicle 1 was not injured and did not receive medical attention. The driver of Vehicle 2 was not reported as injured.

Both vehicles were disabled due to damage sustained in the crash and were towed from the scene.

Table 1. Delta V

	Case Vehicle		Other Vehicle	
	km/h	mph	km/h	mph
Total	17	10.6	15	9.3
Longitudinal	-15	-9.3	-13	-8.1
Lateral	-8	-5	7	4.3
Barrier speed	19	11.8	12	7.5

Exterior of Case Vehicle

Table 2. Vehicle Information



Model year, make and model	1998 Ford Taurus 4-door sedan
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Figure 4. Exterior, Vehicle 1 (1998 Ford Taurus)</p> </div> <div style="text-align: center;">  <p>Figure 5. Exterior, Vehicle 1 (1998 Ford Taurus)</p> </div> </div>	
VIN	1FAFP52U0WG
CDC	01RZEW3

Table 3. Crush Measurements

Plane of Impact	Field L cm/in.	C1 cm/in.	C2 cm/in.	C3 cm/in.	C4 cm/in.	C5 cm/in.	C6 cm/in.
Mid-door	141	3	18	30	32	24	13
	55.5	1.2	7.1	11.8	12.6	9.4	5.1

Interior of Case Vehicle

The interior of the Ford Taurus sustained no damage from occupant contact. There was a substantial amount of intrusion to the right door panel, second seat back, and right C-pillar. The intruded values are reported below in Table 4.

The case vehicle was equipped with bucket seats in the front left and front right seating positions. Both were adjusted to the middle track position. Both front seats were equipped with adjustable head restraints which were not damaged. The rear of the vehicle was equipped with bench seats with folding backs in all three seating positions. The outboard rear seats were equipped with integral head restraints which were not damaged.

Table 4. Intrusions

Intruded Component	Location of Intrusion	Intruded Value cm/in.		Dominant Crush Direction
Door panel	second right	32	12.6	Lateral
Seat back	second right	21	8.3	Lateral
C-pillar	second right	10	3.9	Lateral

Case Vehicle Occupant Protection Systems

The Ford Taurus 4-door sedan was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units.

The front left air bag was housed in the steering wheel hub and was concealed by two asymmetrical H-configuration cover flaps which were not damaged in the crash. The circular air bag was equipped with two tether straps and two vent ports. Contact evidence consisting of several small blood spots was found on the front of the air bag. The bag was not damaged.



Figure 6. Interior, Vehicle 1. Driver's air bag.

The front right air bag was housed in the top-instrument panel position and was concealed by a single irregularly shaped cover flap which was not damaged in the crash. The rectangular air bag was equipped with an unknown number of tether straps and no vent ports. No contact evidence was found on the air bag and the bag was not damaged.

Case Vehicle Occupant Demographics

Table 5. Case Vehicle Occupants Demographics

	Occupant 1	Occupant 2
Age/Sex:	24/Male	25/Male
Seated Position:	Front-left	Front-right
Seat Type:	Bucket - cloth covered	Bucket - cloth covered
Height (cm/in.):	165 65	165 65
Weight (kg/lbs):	68 150	73 160
Pre-existing Medical Condition:	None noted	None noted
Body Posture:	Normal - upright facing forward in seat	Normal - upright facing forward in seat
Hand Position:	Both on steering wheel	Both on lap
Foot Position:	On floor or foot controls	On floor
Restraint Usage:	Manual lap & shoulder restraint	Manual lap & shoulder restraint
Air bag:	Deployed redesigned air bag system	Deployed redesigned air bag system

Occupant Injuries

Table 6. Injuries

Occupant #	Injury	Injury Severity (AIS)	Injury Mechanism
1	Left chest skin contusion	1	Shoulder belt webbing
1	Cervical strain	1	Air bag
2	Not injured	Not injured	Not injured

Occupant Kinematics

The driver (case occupant 01) of the Ford Taurus was seated in a normal upright posture in the front left position of the vehicle. He was wearing the manual lap/shoulder restraint. The front right passenger (case occupant 02) was also seated in a normal upright posture and was wearing the manual lap/shoulder restraint. Seat belt usage was determined through visual inspection by the researcher, the lack of prominent frontal contact evidence, and observations by the investigating police officer at the scene of the crash. There was no indication of pre-impact avoidance maneuvers so the occupants should not have move significantly prior to the impact.

At impact, the case occupants reacted to the 30 degree principle direction of force by moving forward and to the right, loading the lap/shoulder restraints. As the restraints locked, further movement of the occupants was prevented. It appears that the driver came into contact with the deploying driver's frontal air bag-causing the cervical strain. The driver's chest loaded the shoulder belt webbing-causing the left chest skin contusion. The driver was transported from the scene to a hospital where he was treated and released for non-incapacitating injuries. Case occupant 02 did not sustain any injuries and did not appear to have come into contact with any component of the vehicle's interior. He did not receive any medical attention.



Figure 7. Interior, Vehicle 1. Air bag contact.

Scene Diagram

